Sandia National Laboratories / New Mexico

PROPOSAL FOR NO FURTHER ACTION ENVIRONMENTAL RESTORATION PROJECT SITE 227, BUNKER 904 OUTFALL SITE OPERABLE UNIT 1309

June 1995

Environmental
Restoration
Project

United States Department of Energy
Albuquerque Operations Office

PROPOSAL FOR NO FURTHER ACTION

Site 227, Bunker 904 Outfall Site
Operable Unit 1309

SANDIA NATIONAL LABORATORIES/NEW MEXICO

1. Introduction

1.1 ER Site Identification Number and Name

Sandia National Laboratories/New Mexico (SNL/NM) is proposing a risk-based no further action (NFA) decision for Environmental Restoration (ER) Site 227, Bunker 904 Outfall Site, Operable Unit (OU) 1309. ER Site 227 is listed in the Hazardous and Solid Waste Amendment (HSWA) Module IV (EPA August 1993) of the SNL/NM Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Facility Permit (NM5890110518) (EPA August 1992).

1.2 SNL/NM Risk-based NFA Process

This proposal for a determination of an administrative NFA decision has been prepared using the criteria presented in Section 4.5.3 of the SNL/NM Program Implementation Plan (PIP) (SNL/NM February 1994). Specifically, this proposal will "contain information demonstrating that this SWMU has never contained constituents of concern that may pose a threat to human health or the environment" [as proposed in the Code of Federal Regulations (CFR), Section 40 Part 264.51(a) (2)] (EPA July 1990). The HSWA Module IV contains the same requirements for an NFA demonstration:

> Based on the results of the RFI [RCRA Facility Investigation] and other relevant information, the Permittee may submit an application to the Administrative Authority for a Class III permit modification under 40 CFR 270.42(c) to terminate the RFI/CMS [corrective measures study] process for a specific unit. This permit modification application must contain information demonstrating that there are no releases of hazardous waste including hazardous constituents from a particular SWMU at the facility that pose threats to human health and/or the environment, as well as additional information required in 40 CFR 270.42(c) (EPA August 1993).

For a risk-based proposal, an SWMU is eligible for an NFA determination if the NFA criterion established by the SNL/NM permit is met. This criterion, found in Section M.1 of the permit, is as follows: "[T]here are no releases of hazardous waste including hazardous constituents...that pose threats to human health and/or the environment..." This risk-base proposal contains information needed to make the NFA determination.

This proposal is using the technical approach which is the foundation for the SNL/NM corrective action process. The details of the SNL/NM technical approach are provided in Appendix C of the SNL/NM PIP. The first step in the technical approach is the data qualitative review step (the same step used to determine whether the SWMU is eligible for administrative NFA). Should significant uncertainties remain, the assessment of the SWMU continues within the SNL/NM technical approach.

At this site, sufficient data were not available to compare to established action levels or to develop site-specific action levels. Background soil samples were collected and analyzed to

develop upper tolerance limits (UTLs) for metals. Site-specific data were collected to compare to existing soil action levels (proposed subpart S levels) and UTLs. If site-specific concentrations exceeded the proposed Subpart S action levels or UTLs, then a risk assessment was performed. The site-specific concentrations were compared to the derived risk assessment action levels. Concentrations less than these action levels, either proposed Subpart S action levels, background UTLs, or derived risk-based values, triggered this NFA proposal for Site 227.

1.3 Local Setting

SNL/NM occupies 2,829 acres of land owned by the Department of Energy (DOE), with an additional 14,920 acres of land provided by land-use permits with Kirtland Air Force Base (KAFB), the United States Forest Service, the State of New Mexico, and the Isleta Indian Reservation. SNL/NM has been involved in nuclear weapons research, component development, assembly, testing, and other nuclear activities since 1945.

ER Site 227 (Figure 1) is located on land owned by DOE. The site is situated south of Technical Area (TA) II along the eastern edge of ER Site 45. Access to this site is along the TA-II perimeter road. This site is within the TA-II testing exclusion zone.

Surficial deposits in the SNL/KAFB area lie within four geomorphic provinces, which in turn contain nine geomorphic subprovinces. Site 227 lies within the Tijeras Arroyo subprovince. The Tijeras Arroyo subprovince is characterized by broad, west-sloping alluvial surfaces and the 50-meter-deep Tijeras Arroyo. The Tijeras Arroyo subprovince contains deposits derived from many sources, including granitic and sedimentary rocks of the Sandia Mountains, sedimentary and metamorphic rocks of the Manzanita Mountains, and sediments of the Upper Santa Fe Group.

2. History of the SWMU

2.1 Sources of Supporting Information

In support of the request for a risk-based NFA decision for ER Site 227, a background study was conducted to collect available and relevant site information. Interviews were conducted with SNL/NM staff and contractors familiar with site operational history.

The following information sources were available for the use in the evaluation of ER Site 227:

- Confirmatory sampling program conducted in September 1994
- Risk analysis for four radionuclides
- One surface radiation survey
- One unexploded ordnance/high explosives (UXO/HE) survey
- Interviews and personnel correspondence
- Historical aerial photographs spanning 40 years

2.2 Previous Audits, Inspections, and Findings

In November 1993, the Sandia ER staff recognized Site 227 as an SWMU based on the historical operations and the visual evidence of the Storm Drain System Outfall. ER Site 227 was not listed as a potential release site based on the Comprehensive Environmental Assessment and Response Program (CEARP) interviews in 1985 (DOE September 1987). In addition, Site 227 was not included in the Environmental Protection Agency (EPA) RCRA Facility Assessment (RFA) in 1987 (EPA April 1987) and Site 227 was not included in the Hazard Ranking System (DOE September 1987).

2.3 Historical Operations

The outfall discharged industrial effluent and storm water from TA-II (Figure 1). Currently it discharges only storm water. The specific constituents in the industrial effluent are not known. The possible discharge contaminants include chromates, antifoulants, chromium, sodium hydroxide, hydrochloric acid, chromosulfuric acid, diesel, and other petroleum products. Mineral oil is also being considered a potential soil contaminant due to a recent release (June 1994) of mineral oil at a similar outfall, Site 232.

3. Evaluation of Relevant Evidence

3.1 Unit Characteristics

The site is confined to the downstream natural drainage. All releases would be contained in this limited area.

3.2 Operating Practices

Based on interviews and personnel correspondence, the outfall discharged industrial effluent and storm water from approximately 1948 to 1991. Examination of aerial photographs confirms this time frame but provides no additional information.

3.3 Presence or Absence of Visual Evidence

The approximately 200-foot long outfall and the cement culvert are the only physical evidence of the outfall system. No discoloration of soils was observed during site reconnaissance and soil sampling activities.

3.4 Results of Previous Sampling/Surveys

In 1994, the site was visually surveyed for surface indications of UXO/HE. No UXO/HE were found (SNL/NM 1994a). Also in 1994, a surface radiation survey was conducted on the entire site using an Eberline ESP-2 portable scaler, with an Eberline SPA-8 (2 inch X 2 inch sodium iodide) detector. A 30-second integrated count was performed at each proposed

sample location, while scanning the detector over an area approximately 2 feet in radius around the sample location. The alarm was set at 1.3 times the background count rate. No alarms occurred during the survey. No surface anomalies were detected (SNL/NM 1994b).

3.5 Assessment of Gaps in Information

No environmental sampling data existed for Site 227. If contamination was present, potential constituents of concern (metals, radioactive constituents and organic and anionic inorganic constituents), would be expected at shallow depths. Metals and radioactive constituents generally adsorb on soil and precipitate rather than remaining soluble. If organic or inorganic anionic constituents were introduced in the drainage, they should be detectable in surface or shallow subsurface soils.

3.6 Confirmatory Sampling

A surface (0-6 inches deep) and shallow subsurface (6-36 inches deep) soil sampling program was developed and implemented in September 1994. The Confirmatory Sampling and Analysis Plan (SAP) can be found in Appendix A. Those soil sample results exceeding an action level are summarized in Table 1. A complete list of "hits" or detections and quality assurance (QA) results can be found in Appendix B.

For health and safety purposes, a photoionization detector, OVM, was used throughout the field program. The OVM measured no anomalous vapor concentrations.

Surface and shallow subsurface soil samples were collected at the most likely locations of contamination. Four samples were collected at the "head" of the outfall (two surface and two shallow subsurface) and four samples were collected at the furthest extent of visible erosion and scour (two surface and two shallow subsurface), as shown in Figure 1. Every sample was analyzed for target analyte list (TAL) metals[1], chromium^{+6}, total Kjeldahl nitrogen (TKN), and nitrate/nitrite. The four subsurface samples also were analyzed for volatile organic compounds (VOCs). Four samples were analyzed for semivolatile organic compounds (SVOCs), cyanide, total petroleum hydrocarbon (TPH), and explosives. As a general check for radioactive constituents, all the samples were analyzed for tritium and with an in-house gamma spectroscopy, four samples were analyzed for isotopic uranium and plutonium, and two samples were screened with off-site gamma spectroscopy.

3.6.1. Background Samples for Metals and Radioactive Constituents

UTLs for background metals were calculated from analyses of 24 samples collected in the vicinity of the 11 sites discussed in the SAP (Appendix A). UTLs or background

[1] Although the TAL metals analytes include calcium, magnesium, potassium, and sodium, these nontoxic, major cations are not included in the evaluation. They do not pose a significant environmental or human health risk regardless of concentration.

95th percentiles for background radionuclides were calculated from samples collected throughout KAFB (IT 1994). A discussion of background calculations and supporting data and analyses are included in Appendices C and D.

3.6.2 Organic and Nitrogen Compounds

Organic compounds were only tentatively detected; 2-butanone, 4-methyl-2-pentanone, benzo(b)fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene were detected in one to four samples but all were below the quantification limit (qualified with a "J" in Table 1). None of these qualified detections indicate significant contamination. TPH, semivolatile organic compounds, cyanide, and explosives were not detected. Nitrate/nitrite was detected in five of eight samples with concentrations ranging from 2.2 to 14 milligrams per kilograms (mg/kg). TKN was detected in all eight samples, with concentrations ranging from 180 to 670 mg/kg. The main environmental or human health hazard pertaining to reduced nitrogen (as measured in TKN) is that it oxidizes to either nitrate or nitrite. Therefore, it is valid and conservative to compare TKN concentrations with action levels for nitrate and nitrite. The proposed Resource Conservation and Recovery Act (RCRA) Subpart S action levels for nitrate and nitrite are 100,000 mg/kg and 8,000 mg/kg, respectively. The organic and nitrogen compound data indicate an insignificant level of contamination.

3.6.3 Metals

Mercury, selenium, silver, and chromium^{+6} were not detected at Site 227. The maximum local background value for beryllium was 0.53 mg/kg. Beryllium was not detected above 0.53 mg/kg at Site 227. All other metal site concentrations were below UTLs. The metals data at Site 227 indicate no risk to human health and the environment.

3.6.4 Radionuclides

Lead-212 was detected in two samples at activities of 0.78 and 0.74 picocuries per gram (pCi/g), both of which are below the base-wide background UTL of 1.08 pCi/g. Lead-214 was detected in two samples at activities of 0.64 and 0.58 pCi/g, both of which are below the base-wide background UTL of 0.90 pCi/g. Thorium was detected in one sample (227-01-A) at an activity of 1.34 pCi/g, which is below the base-wide background UTL of 2.89 pCi/g. Tritium and plutonium-238 were not detected above the minimum detectable activity (MDA). Uranium-238 was detected in four samples with activities ranging from 0.40 to 0.70 pCi/g, which are all below the base-wide background 95th percentile of 1.0 pCi/g. Uranium-234 was detected in four samples with activities ranging from 0.61 to 0.73 pCi/g, which are all below the base-wide background 95th percentile of 1.1 pCi/g. Plutonium-239/240 was detected at activities of 0.004 and 0.009 pCi/g, both of which are below the one value from the local background analyses of 0.035 pCi/g.

Thallium was detected in Sample 227-03-A at an activity of 0.18 pCi/g. No background values of thallium are available for comparison. One sample of uranium-235/236 had an activity of 0.19 pCi/g, slightly above the base-wide background 95th percentile of 0.168 pCi/g

but below the maximum local background activity of 0.33 pCi/g (based on six analyses). Potassium-40 was detected in Sample 227-03-A at an activity of 25.9 pCi/g, slightly above the base-wide background UTL of 25.34 pCi/g.

3.6.5 Quality Assurance Results

As discussed in the Confirmatory Sampling and Analysis Plan (Appendix A), quality assurance samples, including field duplicates, trip blanks and rinsates, were collected as part of the 11-site sampling program. Analyses indicate that the field soil duplicates were comparable to the original soil sample results. The trip blanks and rinsates indicated no significant sampling contamination. QA results can be found in Appendix B. Level I and Level II data verification was conducted on all data, as described in the PIP (SNL/NM 1994).

3.7 Risk Analysis

To further evaluate the site data for radionuclides with activities above background UTLs (or 95th percentiles) or those without background UTLs, a risk assessment was performed for the combination of potassium-40, thallium, plutonium-239/240, and uranium-235/236, assuming the maximum detected activities.

The risk calculations were designed to produce conservatively large estimates of radioactive dose to counter uncertainties in the soil data. This approach facilitates the following decision regarding future activities at Site 227:

- If the conservative estimates based on the soil data result in an unacceptable dose (greater than 10 mrem/year), further investigation and/or remediation will be needed; or

- If the dose estimates are acceptable, the potential for health hazards at the site is extremely low, and further actions will not be needed.

Radionuclide doses were computed using methods and equations promulgated in proposed RCRA Subpart S documentation (EPA 1990). Accordingly, all calculations were based on the assumption that receptor doses from radionuclides result from ingestion of contaminated soil.

Calculation of radionuclide doses required values of dose conversion factors, which are used to convert radionuclide intakes (in units of pCi/year) into effective dose equivalents (in units of mrem/year). Published values of dose conversion factors (Eckerman et al., 1988 and Gilbert et al., 1989) exist for potassium-40, thallium, plutonium-239/240, and uranium-235/236.

To assure that the computed doses were conservatively large, only the maximum observed activity of each constituent at a site was employed. To consider combined effects, a radiological dose was calculated as the sum of the individual doses.

Following proposed Subpart S methodology, the equation and parameter values used to calculate the summed radioactive dose were:

$$DOSE = \sum_{i} [DSR(i) \times S(i)] \qquad (1)$$

where:

DOSE	=	total effective dose equivalent (mrem/yr);
DSR(I)	=	dose-to-soil concentration ratio for the i^{th} radionuclide (mrem/yr)/(pCi/g), = I X DCF(I);
S(I)	=	soil concentration of the i^{th} radionuclide (pCi/g);
I	=	soil ingestion rate = 0.2 g/day = 73 g/yr; and
DCF(I)	=	dose conversion factor for the i^{th} radionuclide (mrem/pCi).

The PIP stipulates that, for the purpose of computing media action levels, the total radioactive dose at a site should not be greater than 10 mrem/year (SNL/NM 1994), which corresponds to a cancer risk of less that 10^{-6} excess deaths.

The input and results of the risk calculations are presented in Table 2. The summed radioactive dose is less than 10 mrem/year. Therefore, the site is considered to be risk-free in terms of radionuclide contamination.

3.8 Rationale for Pursuing a Risk-Based NFA Decision

Surface soil and shallow subsurface soil samples were collected at the "head" of the outfall (where the flow leaves the concrete flume and spills into the natural drainage) and at the furthest extent of visible erosion/scour where the discharged effluent would have most likely settled. These two areas are the most likely areas for contamination. SNL/NM is proposing a risk-based NFA because representative soil samples from ER Site 227 have concentrations less than action levels; either proposed Subpart S action levels, background UTLs, background 95th percentiles, or derived risk-based values.

In addition

- A site visit in 1993 by ER personnel confirmed the presence of a confined natural drainage with no discoloration in the soils.

- In June 1994, a UXO/HE visual survey was conducted by KAFB Explosive Ordnance Division (EOD) and found no UXO/HE ordnance debris at Site 227 (SNL/NM 1994a).

- In September, 1994, as part of the surface soil sampling effort at Site 227, a surface radiation survey was conducted (SNL/NM 1994b). No surface anomalies were detected at Site 227.

4. Conclusion

Based upon the evidence cited above, ER Site 227 has no releases of hazardous waste or hazardous constituents that pose a threat to human health and/or the environment. Therefore, ER Site 227 is recommended for an NFA determination.

5. References

5.1 ER Site References

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5.2 Reference Documents

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Sandia National Laboratories/New Mexico (SNL/NM), August 1994. Environmental Restoration Project Information Sheet for Site 227, Bunker 904 Outfall Site, Sandia National Laboratories, Albuquerque, New Mexico.

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5.3 Aerial Photographs

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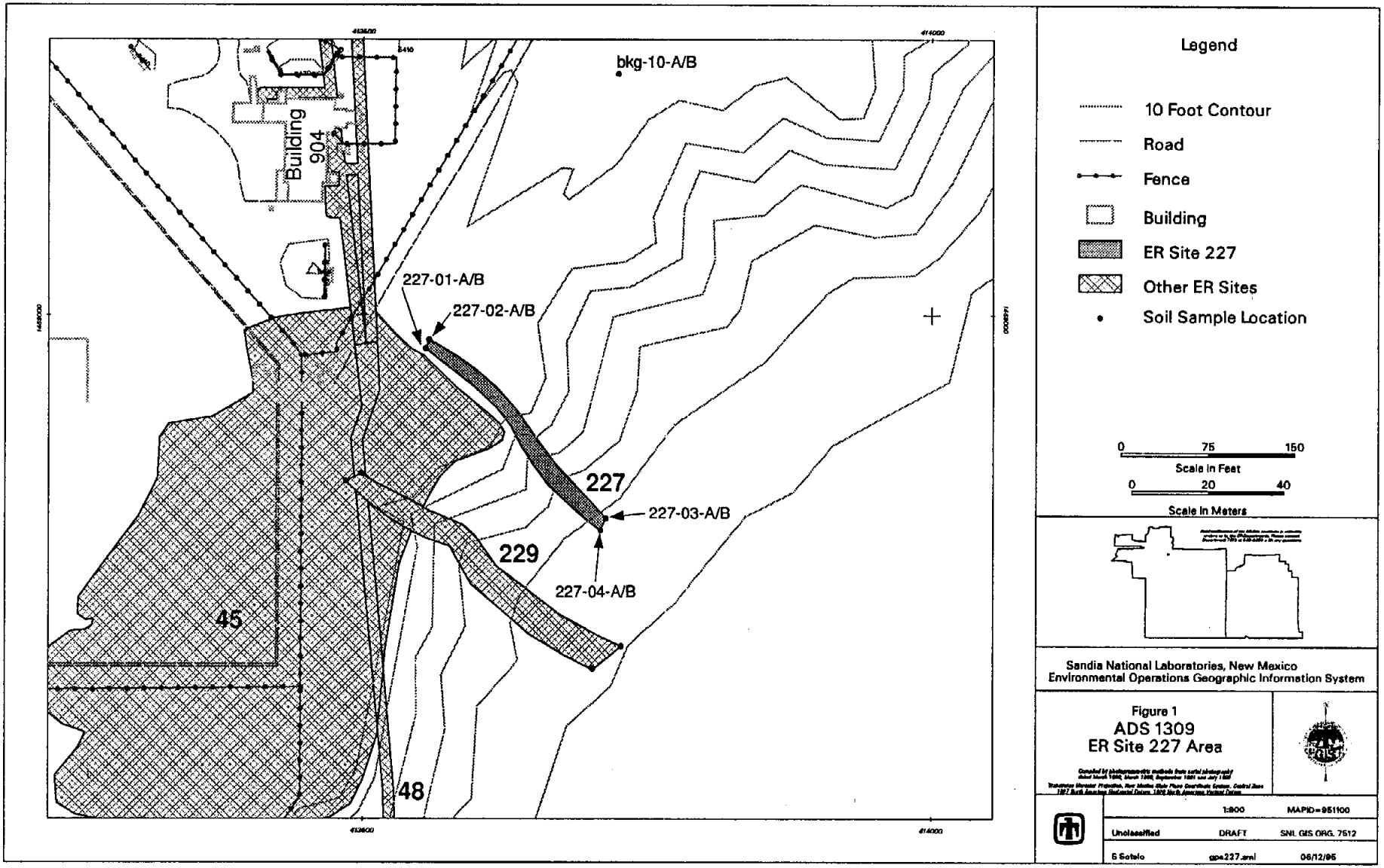

Figure 1. Bunker 904 Outfall Site 227.

Table 1. Site 227 - Results of Shallow Soil Sampling and Analysis

Sample Identifier	Analytical Method	Constituent	Concentration (mg/kg)	Qualifier	Background (mg/kg)	Action Level (mg/kg)
227-01-B	VOCs (8240)	2-butanone	0.007	J		
227-02-B	VOCs (8240)	2-butanone	0.004	J		
227-03-B	VOCs (8240)	2-butanone	0.005	J		
227-04-B	VOCs (8240)	2-butanone	0.004	J		
227-01-B	SVOCs (8270)	4-methyl-2-pentanone	0.001	J		
227-01-B	SVOCs (8270)	Benzo(b) fluoranthene	0.068	J		
227-01-B	SVOCs (8270)	Chrysene	0.049	J		
227-01-A	SVOCs (8270)	Fluoranthene	0.066	J		
227-01-B	SVOCs (8270)	Fluoranthene	0.094	J		
227-01-A	SVOCs (8270)	Phenanthrene	0.055	J		
227-01-B	SVOCs (8270)	Phenanthrene	0.084	J		
227-01-A	SVOCs (8270)	Pyrene	0.040	J		
227-01-B	SVOCs (8270)	Pyrene	0.062	J		
227-01-A	TKN (Acid Digestion)	TKN	450			100,000/8,000
227-01-B	TKN (Acid Digestion)	TKN	370			100,000/8,000
227-02-A	TKN (Acid Digestion)	TKN	400			100,000/8,000
227-02-B	TKN (Acid Digestion)	TKN	180			100,000/8,000
227-03-A	TKN (Acid Digestion)	TKN	300			100,000/8,000
227-03-B	TKN (Acid Digestion)	TKN	220			100,000/8,000
227-04-A	TKN (Acid Digestion)	TKN	670			100,000/8,000
227-04-B	TKN (Acid Digestion)	TKN	390			100,000/8,000
227-01-A	NO_3/NO_2 (353.2)	NO_3/NO_2	6.3			100,000/8,000
227-02-A	NO_3/NO_2 (353.2)	NO_3/NO_2	2.7			100,000/8,000
227-02-B	NO_3/NO_2 (353.2)	NO_3/NO_2	2.3			100,000/8,000
227-04-A	NO_3/NO_2 (353.2)	NO_3/NO_2	14			100,000/8,000
227-04-B	NO_3/NO_2 (353.2)	NO_3/NO_2	2.2			100,000/8,000
227-03-A	Gamma Spec (600 901.1)	Potassium 40	25.9 pCi/g		25.34 pCi/g	6,130 pCi/g
227-03-A	Gamma Spec (600 901.1)	Thallium	0.18 pCi/g			42.6 pCi/g
227-01-B	Isotopic Plutonium (600 7-79-081)	Plutonium 239/240	0.009 pCi/g		0.035 pCi/g	2.1 pCi/g
227-03-A	Isotopic Plutonium (600 7-79-081)	Plutonium 239/240	0.004 pCi/g		0.035 pCi/g	2.1 pCi/g
227-01-A	Isotopic Uranium (HASL-300 4.5)	Uranium 235/236	0.19 pCi/g		0.33/0.168 pCi/g	45 pCi/g

Table 1. Site 227 - Results of Shallow Soil Sampling and Analysis (Concluded)

Notes

A "J" qualifier means detected at a concentration below the laboratory reporting limit.

For uranium-235/236, the first background value is the maximum of six local background values; the second value is the base-wide background 95th percentile.

For plutonium-239/240, the background value is the maximum of six local background values.

For potassium-40, background is the 95 percent upper tolerance level for the base-wide background data.

Proposed Subpart S action levels for nitrate and nitrite are 100,000 and 8,000 mg/kg, respectively.

Radionuclide action levels are calculated risk-based levels.

Table 2. Radionuclide Risk Calculations for Site 227

Constituent	Activity (pCi/g)	DCF(I) (mrem/pCi)	Individual Dose (mrem/year)	Source of DCF
Plutonium-239	9.00E-03	4.30E-03	2.83E-03	Eckerman et al., 1988
Potassium-40	2.59E+01	1.90E-05	3.59E-02	Gilbert et al., 1988
Thallium-204	1.80E-01	3.20E-06	4.20E-05	Eckerman et al., 1988, assuming Thallium-204
Uranium-235	1.90E-01	2.60E-04	3.61E-03	Gilbert et al., 1989
Summed Dose			4.24E-02	

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ADDITIONAL /SUPPORTING DATA

CAN BE VIEWED AT THE
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AND SECURITY (ES&H and Security)
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